

raphy of the headquarters of the Yukon River and the approaches to the Klondike region. According to this account gold was known to exist in the Yukon country as early as 1847, and Mr. Harper in 1872 reported gold on the Yukon everywhere, but coarse gold was not discovered until 1886, on the Forty Mile River; in 1896 gold was found in abundance in the Klondike district. At the close of his text Mr. Ogilvie gives the following summary compiled from his records of temperature, but we infer that the observations were made at many places in the course of his travels as a surveyor, and therefore do not represent any specific station. Had we the original record, then the individual observations could be entered upon the daily weather maps and would give us more exact information as to the northern limit of the cold waves that flow from the northwest provinces southeastward into and over the United States.

Year and month.	Mean of maxima.	Mean of minima.	Highest maximum.	Lowest minimum.
	° F.	° F.	° F.	° F.
1887, August .....	.....	39.9	.....	21.6
September .....	.....	31.7	.....	16.0
October .....	.....	18.5	.....	4.0
November .....	.....	-5.1	.....	-24.1
December .....	-27.6	-33.6	10.5	-55.1
1888, January .....	-15.3	-25.3	13.0	-53.5
February .....	-4.3	-16.8	24.2	-52.7
March .....	.....	-11.5	.....	-52.7
April .....	.....	-20.4	.....	-37.7
May .....	43.3	19.8	55.0	-1.8
1895, August .....	.....	40.1	.....	28.0
September .....	.....	30.9	.....	21.5
October .....	.....	19.4	.....	-12.7
November .....	11.9	4.2	38.5	-36.3
December .....	-13.8	-18.2	6.0	-55.4
1896, January .....	-23.0	-41.9	6.0	-67.9
February .....	-11.6	-25.5	32.0	-64.8
March .....	18.1	-2.4	39.5	-37.3
April .....	24.0	2.0	49.0	-28.4
May .....	48.7	28.8	62.0	5.0
June .....	65.1	39.8	80.0	27.8
July .....	68.9	44.5	81.0	33.0
August .....	62.6	42.1	76.0	27.2
September .....	50.5	34.3	63.0	4.8
October .....	32.9	20.2	51.0	-1.0
November .....	-6.0	-14.7	22.5	-38.0
December .....	-6.5	-17.4	11.0	-44.5
1897, January .....	-14.0	-24.0	10.0	-55.6
February .....	0.6	-12.3	31.0	-36.0
March .....	.....	-14.7	.....	-54.3
April .....	.....	18.1	.....	5.0

#### WEATHER BUREAU SERVICE IN ALASKA.

THE MONTHLY WEATHER REVIEW for April gave some account of the proposed establishment of an Alaskan section of the Climate and Crop Service, under the direction of Mr. Hector L. Ball. The following interesting letter has been received from him:

SITKA, ALASKA, June 15, 1898.

Prof. WILLIS L. MOORE,  
Chief of Weather Bureau,  
Washington, D. C.

SIR: I have the honor to inform you that a location has been secured for at least six months, and that the instruments have been placed in position. Observations of temperature and rainfall were begun at 8 a. m. this date. The office room has not yet been papered and cleaned, hence the barometer has not been hung, but this will be done in about three days. The location is an ideal one, being on the top of a hill about 125 feet above mean tide, and about one-fourth of a mile from the bay. This will apparently give temperature and rainfall values that will be unaffected by the ocean and free from mountain currents. The office building is very small, the Weather Bureau office being 8 by 15 feet. However, we were very fortunate to secure so good a location, as some officials are yet without office quarters. No definite arrangements have been made for quarters after the end of the present lease, but it is hoped that the present quarters can be re-leased.

The office roof would not permit of a platform, it being too small and insecure. Accordingly, I have had erected a platform 20 by 20 and 6 feet from the ground. This holds the anemometer and wind vane and the sunshine recorder. The instrument shelter I have erected over sod. As soon as a suitable day arrives photographs will be taken of the building and instruments, and a copy will be sent you. The elevation will also be taken and recorded. As stated in a former letter one barometer was broken in transitu, so I have no means of determining the error, if any, of the one in use.

I have everywhere been cordially received by the people of this Territory. The establishment of a Weather Bureau and Experiment Station meets the wishes of every one, and will doubtless be of great value to those living here and to people of other countries.

Thus far the weather has been very delightful; the first half of June having been unusually warm, dry, and sunshiny. Vegetation is marvellously rich and abundant, and were it not for sudden changes, cool nights, and the prevailing cloudiness this would make a fine agricultural and residential country.

(Signed)

H. L. BALL,  
Section Director.

#### NOTES FROM THE JUNE REPORTS OF THE CLIMATE AND CROP SECTIONS.

##### ARIZONA.

Sand or dust storms were recorded at seven stations; that on the 18th was unusually severe, extending over Cochise, Graham, Pima, and the southern part of Navajo counties. Among the special reports are the following: Fort Grant, Graham County, altitude 4,916 feet, from 3:55 to 4:40 p. m., severe hurricane storm from north-northeast, carrying a large amount of dust from the Gila Valley, breaking large limbs from almost every cottonwood tree; Oro Blanco, Pima County, altitude 4,200 feet, most severe sand storm ever seen here occurred about sundown on the 18th. (The hours here given are likely to be local Pacific standard, not seventy-fifth meridian time.)

##### CALIFORNIA.

For the first time in many months the printed report of the California section is received in time to be included in this collection of notices. The number for June contains a special contribution by Dr. C. M. Richter on the climatology of the citrus belt in California, with special reference to the absence of frosts from November to April. He says:

There is no doubt that the western slope of the Sierra Nevada foothill region and also that part of southern California, inland, of which Riverside is a fair representative, offer very favorable climatic conditions for the growth of citrus fruit. They are subject, however, although rarely, to minimum temperatures, which have affected and which may affect citrus fruit disastrously. The winter of 1854 was probably more severe than the winter of 1888, or of 1898, when minimum temperatures below 20° occurred in some portions of these citrus regions. It appears that the region of the Santa Barbara foothills and probably of the entire foothill region of the Coast Range southeast of Santa Barbara, wherever the foothills do not recede too far from the ocean, is never affected in such winters to a degree sufficient to injure the growth of citrus fruit. Regular observations of temperature have been taken at Santa Barbara since 1870. The archives of the mission do not mention any injury done to any vegetation by cold temperature before 1870. Since 1870 the two lowest temperatures observed at Santa Barbara were 28.5°, on one January morning, 1888, and the next lowest, 30.5°, on another morning of the same month and year. The comparison of the climate of Santa Barbara city and Pine Crest exhibits strikingly the greater warmth of the foothill region and attests the immunity of the Santa Barbara foothills from killing frosts.

Minute studies of this character into the details of the distribution of climatic peculiarities will repay the labor in every State of the Union, since there is thus made known some positive knowledge in place of the ignorance that would otherwise prevail—knowledge that will inevitably lead to the cultivation of special crops in regions that would otherwise be neglected.

This same June report has also a special article by Mr. W. H. Hammon on the drought of 1897-98 in California. He shows that there was practically no difference in the rainfall and its distribution in the dry seasons from November to May, 1850-51, 1863-64, 1876-77, and 1897-98; therefore, the last drought is not unprecedented. Taking the State as a whole, the rainfall during the past season has slightly exceeded half the amount of a normal year. The greatest deficiencies were in southern California and the interior valleys, where the normal precipitation is light. The deficiency in the Sierras and along the northern coast, where the normal rainfall is heavy, was from 20 to 40 per cent.

Mr. Hammon is, fortunately, able to show that this severe drought is not altogether an unmixed evil, since many have learned to make themselves, in a measure at least, independent of one season's rainfall. It is a peculiar fact that almost throughout the entire State a supply of water can be found a few feet below the surface. Prof. Milton Whitney has shown the remarkable control over the water supply exerted by certain soils in certain spots in California—a power that has not yet been explained, but undoubtedly depends principally upon the physical structure of the soil. But without waiting to solve these soil problems, Mr. Hammon says:

In seasons like the present, where a dry stratum of earth remains between the layer of soil moistened by the rainfall and that beneath which is permanently moist, this capillary action is impossible. Owing to improved pumping machinery the experiment has been successfully tried in various parts of pumping sufficient water from the substratum to thoroughly saturate the soil, thus rendering those sections independent of the current seasonal rainfall, and permitting them to raise a crop, the profit on which will be many times that of ordinary seasons, owing to the generally small yield. By this means the vast fruit regions of Santa Clara and adjacent counties will mature full crops of almost every variety of fruit. Large areas of grain have thus been irrigated by pumping or siphoning water from the rivers and sloughs. Rich tule basins in the valleys, which are under water in normal years, have this year produced heavy grain crops.

This last line reminds the Editor of a point brought out by him in a paper on the relation between climates and crops, to the effect that the statistics of crop production for any year give the average result for crops raised on all kinds of soil, dry uplands and wet lowlands, as well as in all kinds of weather. In dry years the lowlands do best, but in wet years the uplands; late spring frosts kill the plants that were planted too early, but early autumn frosts injure the plants that were started too late. The efforts of the farmer are directed toward such methods of agriculture as will better the crops on the lowlands in wet seasons and on the uplands in dry seasons. Mr. Hammon concludes this excellent paper by an article on seasonal predictions in California, which departs somewhat from the remarks previously made in the MONTHLY WEATHER REVIEW, as to the slow passage of droughts and other atmospheric influences from the Indian Ocean and Australia, first northward into southern Asia, and then eastward over the Pacific and America until they die away in Europe.

Every continent and ocean introduces its own series of disturbances into the circulation of the earth's atmosphere, which latter thus becomes a much more complex matter than in the ideal case of a uniform smooth globe treated of by Ferrel and other founders of dynamic meteorology. The greatest of all these disturbances are those introduced by the great chain of mountains that begins at Patagonia, runs northward through Alaska, and again reappearing in Siberia, runs southwest to the Asiatic plateau. The influence of the summer's heat on the Eastern Continent diverts the trade winds of the southern Indian Ocean from their ideal course, and a vast amount of moisture is brought by the southwest monsoon to India, Siam, and China, whence it is whirled eastward by the same upper currents that caused the spread of the Krakatoa dust vapor, during nearly three years, over the whole Northern Hemisphere. The spread of this vapor is a valuable index to the existence of the great upper currents and the interaction of the northern and southern atmospheres upon each other.

We shall take pleasure in reprinting portions of Mr. Hammon's article, omitting any reference to the Kuro Siwo or the Japanese Gulf Stream, as that could not possibly have any important bearing on the atmospheric phenomena that we are studying.

#### COLORADO.

The snow line, as usual, has receded nearly to the tops of the highest peaks and ranges. Hailstorms were unusually

frequent and destructive. The greatest damage from this source occurred on the 6th between Rockyford and Lajunta, where all crops, excepting spring wheat, were completely destroyed. This storm took in a strip of about 5 miles wide and 12 long, being especially severe over a width of about 2 miles. The stones varied from about the size of a pea to a hen's egg and were accompanied by a severe wind; the hail was left in drifts 15 inches deep.

#### ILLINOIS.

Among the heaviest rains were those reported from Equality, on the 26th, about 5.50 inches in one hour, and Elgin, from 10 p. m. of the 24th until 4 a. m. of the 25th, during which 5 inches of rain fell; Riley, 9:15 p. m., 24th, to 3:45 a. m., 25th, 4.40 inches. In general, the storms throughout the month were exceedingly local in character and even in the monthly totals differences of 4, 5, and 7 inches are found for stations but a few miles apart.

#### IOWA.

A quotation from an anonymous exchange is given, enumerating the following cases of heavy rainfall in twenty-four hours: 31.76 inches in one day of last December at Medunkeni, in northern Ceylon; 31.17 inches in twenty-two hours at Joyeuse, France; 30 inches in twenty-six hours at Genoa; 33 inches in twenty-six hours at Gibraltar; 24 inches during one night near Bombay; 30 inches on each of five successive days on the Khasia Hills, India. The Editor will be glad to know the exact authority for these figures; they differ considerably from those given by Prof. M. W. Harrington in his article on "Central American Rainfall." In Iowa, itself, the June Review gives 7.21 inches at Greenfield, on the 9th as the largest daily amount. "Cyclones" are reported at Charles City and Dows, on page 7, but on page 8 it is said "the State happily escaped ravages by tornadoes, but was not wholly exempt from damages by severe winds." The newspapers of the country have lately spoken very freely about the frequency of tornadoes in the West Indies, by which they evidently mean hurricanes. It is to be hoped that both the section reports and the daily press will at some early future date come into harmony with the best practices of meteorologists as to the use of the words "hurricane," "typhoon," "tornado," and "cyclone."

#### KENTUCKY.

A meteor occurred at Maysville, on the 3d, accompanied by a rumbling noise and shock as of an earthquake. We are very glad to see the care with which this account distinguishes between the real earthquake and the meteor. It is by no means uncommon for an observer to enter "light earthquake" in his record when he might, with a little care, have ascertained that the noise and shock proceeded from a meteor or possibly a distant explosion of gunpowder.

#### MARYLAND.

Prof. T. J. A. Freeman, of Woodstock College, gives a very full description of a remarkable hailstorm at that place, Monday, May 16. "Clouds began to gather about 2:30 p. m.; rain began at 3:55 p. m., but in two minutes turned suddenly into large hailstones which descended for about twelve minutes, the largest being 4 ounces in weight. In a square yard one could easily have collected a coal scuttle full." This would correspond to about 30 pounds to the square yard, or an average of about 0.6 inch in depth. The hail ceased at 4:10 p. m. and heavy rain continued for about three minutes. Another heavy rain and thunder, without hail, occurred from 4:50 to 5:20. The total rainfall was 1.67 inch, whence we infer that in the first rainfall the hail constituted about one-half of the total precipitation. The exact ratio between the weight of hail and of rain that falls with it is a quantity

very much desired. In the driest climates the hail undoubtedly may be more than the rain, whereas in wet climates it is much less. The quantity of hail and of water should be measured separately when possible; taken in connection with the size of the hailstones, and the duration of the hail fall, it gives us some idea of the process going on within the thunder clouds.

#### MISSOURI.

Severe hailstorms seem not to have occurred, and the heaviest rainstorm was 3 inches in two hours on the 26th, at Avalon. At Rolla a severe hailstorm occurred on the 19th, 9:12 a. m. to 9:26 a. m.; the largest stones were 1.25 inch in diameter.

#### NEW ENGLAND.

Vernon, Vt., reports an earthquake on the 11th, at 1:25 a. m., which was distinctly felt and jarred the house. This seems to be quite an isolated case, and it is worth inquiring whether this jar was not due to something else than a true earthquake.

#### NEW JERSEY.

A quotation from the Trenton State Gazette states that a brilliant meteor was observed there on Wednesday evening, June 22, at 10 p. m., illuminating the northwestern sky. It is also said that "the meteor went from southeast to northeast, and left a great luminous streak across the sky, and \* \* \* a thunderous report was heard." These and other items seem scarcely consistent with each other, but we are pleased to note that the report from New England Section states that at Middletown, Conn., at 10 p. m. of the 22d, a handsome meteor passed over this city toward the southwest. It is, therefore, evident that the meteor which passed over Middletown is the same as that observed at Trenton and Paterson. If it was seen to the northwest of Trenton, as seems most likely, and passed from northeast to northwest, instead of, as above described, from southeast to northeast, one might make an approximate computation of its altitude above the earth. The chances are that a bright meteor like this will be seen by many voluntary observers, or their friends. If every one would carefully record the apparent angular altitude and the exact bearing of the meteor at one or more points, say the beginning, or middle, or end, we should have the means of making exact computations which would be of value both to the astronomer and the meteorologist. It is by means of these bright meteors that one has been able to prove that there must be an appreciable atmosphere a hundred miles above the earth's surface, where the barometric pressure is not 0.0001 inch. The light gases at this high elevation must be entirely distinct from the gases that we know at the earth's surface.

The New Jersey report also gives an account of one of the severest thunderstorms ever experienced in that State. It came from Penn, Bucks County, Pa., adjoining Trenton, and struck the latter place about 3 p. m., and for half an hour the thunder and lightning were incessant and terrifying. It passed into Ocean County and the sea shore toward the east-southeast. All residents of the Atlantic States are familiar with the general course pursued by these afternoon and evening thunderstorms. They appear to originate to the westward near the first row of important hills or mountains, consequently on the eastern edge of the Appalachian range. They move eastward with great steadiness. Sometimes the path is toward the northeast, sometimes toward the southeast, but these are rare extremes, the average being toward the east by south. They start as great clouds, growing rapidly in size, and by the time they have moved 20 or 30 miles eastward, viz, within the first hour of their growth, they have begun to precipitate rain. Before that time the lightning and mutterings of thunder have been confined to the bosom

of the cloud itself, but after that the flashes frequently strike to the earth, and sometimes strike simultaneously from cloud to cloud for a distance of 20 miles, with flashes to the earth at either extreme. These big clouds, or incipient thunderstorms, do not usually appear singly, but form an almost continuous series, stretching northeast and southeast from southeastern New York throughout the Atlantic States to Georgia. The spots at which the clouds are most likely to form can be fixed quite definitely by the statistics of the past twenty-five years. Owing to their eastward movement, at the rate of from 10 to 30 miles per hour, the whole area of the Atlantic coast States is liable to be traversed by a series of storms in the course of an afternoon, each of which is most severe in a certain central path, apparently beneath the highest portion of its cloud, while between the paths of any two neighboring storms there is a region where little or no rain falls on that day, although it may receive some on the next occasion. The presence of these so-called local thunderstorms has a slight effect upon the barometric pressure, as shown by violent and very rapid oscillations on the self-registers, but as these last but a few minutes at most, they are not likely to be observed by the use of the ordinary mercurial barometer; the aneroid is far more sensitive, and one that records by delicate optical methods shows a continual state of oscillation within a very narrow range. The wind and cloud, temperature, and especially the lightning, thunder, rain, and hail are the items demanding most careful observation and by means of which we may plot the progress of each storm, and shall, eventually, be able to predict their arrival at any place. If all the telephone and telegraph stations within a distance of 50 miles northwest and southwest of New York, Philadelphia, Washington, or any other city on the Atlantic coast were organized into a system for the immediate information of the occurrence of a thunderstorm, or even of thunder alone, the Central Office would be able to chart the location and early movement of the storm in a few minutes and predict quite exactly the time and the style of its arrival at any point. Of course, the prediction will not be in advance of the storm by more than three hours at the most, but even that amount of forewarning would be very useful in many cases.

#### A HIGH RAINBOW.

Mr. Sydney T. Moreland, of Lexington, Va., communicates to *Nature* (June 16, Vol. LVIII, p. 151) a note on a high rainbow observed on Sunday afternoon, May 29, at his residence. The sun was about an hour and a half high, at 5:40 p. m., local time (so called by him, but perhaps more accurately seventy-fifth meridian, or eastern time). The bow was in the west about 70° from the horizon, with its convex side to the sun; the colors were fairly well brought out, the red being on the convex side and the violet on the concave side. There were but very few thin clouds and no rain.

Halo phenomena in the daytime attending the sun are much more common than is ordinarily supposed. They can easily be detected by examining the region about the sun, not with the naked eye and direct vision, but either through a neutral tint glass or by looking at the reflection of the skylight in a basin of water.

We must commend Mr. Moreland and all interested in the subject to the article by Rev. K. Schipps in the *MONTHLY WEATHER REVIEW*, July, 1897, pp. 294-296, and also to the corresponding note by the Editor on pp. 305-306. Apparently the rainbow observed by Mr. Moreland was a circumzenithal horizontal arc tangent to the halo of 46°, while the halo itself was invisible. These halos are due to ice needles in the upper layers of the air and may attend storms without indicating any approaching change in the weather.